FPM & H_2SO_4 Test Method Evaluation on the Trimer Control System

at

Guardian Industries Corp.
14600 Romine Rd
Carleton, MI 48117

Test Dates: June 15-16, 2016

Project 16-227

Prepared by:
Empire Stack Testing, LLC. (AETB)
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July 15, 2016

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1. TEST RESULTS SUMMARY (TRS)

Table 1-1: FPM Results Summary

Site	Date	Run	Stack Parameters					
			O_2	CO_2	Moisture	Temperature	Flow Rate	
			(%)	(%)	(%)	(F)	(ACFM)	(DSCFM)
RM 05 Outlet	6/15/2016	1	11.9	6.6	13.5	617	136402	56417
	6/15/2016	2	7.9	8.4	13.7	630	137290	55881
	6/15/2016	3	11.7	6.7	13.4	619	133297	54979
		Average	10.5	7.2	13.53	622	135663	55759

Site	Date	Run	FPM Emissions		
			gr/DSCF	(lbs/hr)	(lbs/ton glass)
RM 05 Outlet	6/15/2016	1	0.0078	3.76	0.21
	6/15/2016	2	0.0060	2.88	0.16
	6/15/2016	3	0.0062	2.93	0.17
		Average	**0.0067**	**3.19**	**0.18**
Permit Limit			n/a	n/a	**0.45**

Table 1-2: Production Data Summary

Production Data Summary				
		Production Rate		Pressure Drop
Date	Time	Tons/Day	Tons/hr	in. WC
6/15/2016	0855-1008	424	17.67	12.9
6/15/2016	1145-1255	424	17.67	12.7
6/15/2016	1428-1549	424	17.67	12.7
6/16/2016	1010-1046	425	17.71	12.2
6/16/2016	1226-1302	425	17.71	12.8
6/16/2016	1420-1456	425	17.71	12.2

3. INTRODUCTION

3.1 Introduction

Guardian Industries Corp. (Guardian) has contracted Empire Stack Testing, LLC. (Empire) to perform Filterable Particulate Matter (FPM), Sulfur Dioxide (SO_2), and Sulfuric Acid (H_2SO_4) testing services on their glass furnace in Carleton, Michigan. Testing used RM5 at the Trimer outlet stack, and CTM-13 at both the inlet and outlet of the Trimer control system.

Section 5 of this report contains the sampling and analytical procedures used to perform the test program. Section 6 details the quality assurance/quality control (QA/QC) procedures for the test program.

3.2 Test Program Objective

This test program is required annually to quantify the FPM, SO_2, and H_2SO_4 emissions from the inlet and outlet of the Trimer control system. All testing followed applicable methodologies of the Environmental Protection Agency (EPA), and as defined in Table 3-1, below.

3.3 Test Personnel

Coordinating the test program were:

Michael Smolenski
Guardian Industries Corp.
(734)-654-4283

David Patterson
MDEQ
(517)-284-6782

Michael T. Karter, QSTI
Empire Stack Testing, LLC.
(716)-481-6749

Tarifur Rahman
Maxxam Analytics International
(905)- 817-5790, ext. 5790

3.4 Test Plan

Testing for all parameters was completed in triplicate following Reference Methods (RMs). The test program incorporates reference methods outlined in the United States Environmental Protection Agency (USEPA) Code of Federal Regulations Title 40, Part 60 (40CFR60), Appendix A. See Table 2-1 below.

3.5 Test Schedule

Day 1 (June 13): Mobilize to Guardian
Day 2 (June 14): Complete setup for FPM & RATAs (~ 8 hours)
Day 3 (June 15): Complete both inlet & outlet RATAs and Emission Testing for FPM (~ 8 hrs.)
Day 4 (June 16): Complete inlet & outlet testing for H2SO4 (~ 8 hours)
Day 5 (June 17): Demobilize from site

Table 3-1: Summary of Test Plan

PARAMETER	METHOD	ANALYSIS	SAMPLE DURATION (MINUTES)	TEST LOCATION(S)	PERMIT LIMIT (OUTLET)
Flow Rate	RM 1 & 2	S-Type Pitot Tube / Manometer	various	Inlet & Outlet	n/a
Dry Molecular Weight	RM 3	O_2 and CO_2 Fyrites	various	Inlet & Outlet	n/a
Moisture	RM 4	Gravimetric	30	Inlet & Outlet	n/a
FPM	RM 5	Gravimetric	60	Outlet	0.45 lbs / ton of glass
H_2SO_4 & SO_2	CTM 013	Ion Chromatography	30	Inlet(1) & Outlet Ground Site	1.6 lbs H_2SO_4 / hr 1.2 lbs SO_2 / ton of glass

NOTES:

(1) The inlet site has a single test port, therefore a non-isokinetic sample was collected at a single traverse point. Emission rates were calculated using the flow rate measured at the outlet site. The CTM013 H2SO4 samples were also analyzed for SO2.

CTM: Conditional Test Method
FPM: Filterable Particulate Matter
H_2SO_4: Sulfuric Acid
RM: United States Environmental Protection Agency Reference Method
SO_2: Sulfur Dioxide

3.6 Process Description

Flat glass manufacturing Line #2 consisting of a raw material melting Furnace, glass forming and finishing, and glass cutting. Line #2 produces flat glass using the float method. Materials are weighed and mixed with water in the batch house before entering the natural gas fired Furnace. Glass then enters the tin bath to be formed and drawn. Next, it enters a lehr to reduce its temperature. The emission unit is controlled by a new (Trimer ECS) Control Device consisting of a Dry Scrubber, Particulate Filter, and Selective Catalytic Reduction (SCR).

3.7 Plant data

The plant's SCADA system continuously records the operating data included in the test report. The plant provided and summarized pertinent operating data to represent plant operation. These data and summaries were provided electronically (MS Excel).

4. PRESENTATION OF RESULTS / EXECUTIVE SUMMARY

This Executive Summary discusses, in detail, the test results and any anomalies, their resolution, and any effect on the results quality or usability.

4.1 Discussion of Results

Testing was completed on June 15-16, 2016 for FPM, H_2SO_4, and SO_2. During this test program, the facility operated at a production rate of 424 tpd (17.67 tph) on 6/15/2016 and 425 tpd (17.71 tph) on 6/16/2016.

The results indicate that the measured emissions are compliant with their permit limits. All field and lab data are included in the appendices of this report.

4.1.1 Isokinetics

Each RM 5 sample run for FPM met the isokinetic limit of 100 % ± 10%. These and other QAQC criteria are summarized in Table 1-4.

4.1.2 FPM Test Result

The average FPM emissions were measured to be 0.18 lbs/ton; which is compliant with limit of 0.45 lbs/ton. See Summary Table 1-1.

4.1.3 H_2SO_4 Test Result (CTM 13)

The average emission rate of sulfuric acid was 0.33 lbs/hr and 0.0188 lbs/ton of glass. The unit demonstrated compliance with the emission limit of 1.6 lbs/hr. The sulfuric acid control equipment yielded a control efficiency (CE) of 68.4%. See Table 1-3.

4.1.4 SO_2 Test Results (CTM 13)

The sulfur dioxide emission rate was quantified as 10.21 lbs/hr and/or 0.58 lbs/ton of glass of glass. The unit demonstrated compliance with the emission limit of 1.2 lbs/ton of glass. The sulfur dioxide control equipment yielded a control efficiency (CE) of 76.6%. See Table 1-3.

4.2 Anomalies

4.2.1 CTM 13 R5 C2 Recovery

During the recovery of the second CTM 13 run (R5), "R5 IN C2" and "R5 OUT C2" were accidently reversed. No samples were contaminated as a result, only mislabeled. The

mistake was detected while analyzing the laboratory data; in response the SO_2 data for "R5 IN C2" was input into the CTM 13 Outlet spreadsheet and vice versa.

4.2.2 Typographical Error in Laboratory Results

A typographical error was detected in the laboratory results. In the CTM 13 results "Isopropanol Volume" is listed. No isopropanol was shipped to the laboratory, this should read "Deionized H_2O".

No other anomalies were recorded during testing nor report production.